PRC AGENDA: 02-03-16
ITEM: VI. B.

CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

Memorandum

TO: PARKS AND RECREATION COMMISSION

FROM: Jason Condit

SUBJECT: **ALTERNATIVE SPORTS FIELD FEASIBILITY STUDY**

DATE: January 19, 2016

Approved | Date:

RECOMMENDATION

Approve the Use of an Alternative Sports Field Surface.

BACKGROUND

A feasibility study was prepared to assess the use of soil based fields as a viable alternative to natural grass or synthetic turf for athletic purposes.

ANALYSIS

The purpose of this study is to identify relevant examples of soil based field applications and assess the benefits and drawbacks of developing a soil based field within San José. To assess the feasibility of developing soil based fields, a number of issues were considered including, but not limited to: the cost for developing a site, athletic performance, operational durability, maintenance requirements, resource consumption, environmental impacts, public safety, and visual quality. The attached alternative sports field presentation provides an overview to determine whether an application of this method is appropriate or desirable for the City of San José.

EVALUATION AND FOLLOW-UP

PRNS will meet with each Council Office to discuss a possible location for a pilot study.

Jason Condit
Project Manager

Attachments:
Alternative Sports Field Presentation
Alternative Sports Field Feasibility Study – Final Draft

CITY OF SAN JOSE

ALTERNATIVE SPORTS FIELDS

WHY?

- REASONS TO STUDY AN ALTERNATIVE FIELD SYSTEM
  - ON GOING DROUGHT CONDITIONS
  - INCREASE IN DEMAND FOR FIELDS
  - COST OF OPERATIONS AND MAINTENANCE

  - REALITIES OF CURRENT SYSTEMS
  - NATURAL TURF FIELDS:
    - PREMIUM PLAYING SURFACE
    - HIGH MAINTENANCE
    - HIGH WATER
    - RECOVERY TIME FOR GRASS
  - ARTIFICIAL TURF FIELDS:
    - HIGH USE
    - HIGH INSTALLATION COSTS
    - HIGH REPLACEMENT COSTS
    - HIGH FIELD RENTAL COSTS

Children playing soccer on a soil field

SAN JOSE

- WATSON PARK

Watson Park after Construction

Watson Park Prior to Closing for The Past Year

WHAT?

- ASSESS THE USE OF SOIL BASED FIELDS AS A VIABLE ALTERNATIVE TO NATURAL GRASS OR ARTIFICIAL TURF FOR ATHLETIC PURPOSES

Children playing soccer on a dirt field

RESEARCH

- EXAMPLES OF SOIL-BASED FIELD USE

Cabo San Lucas, Mexico

RESEARCH

- EXAMPLES OF SOIL-BASED FIELD USE

Tasiilaq, Greenland

RESEARCH

- EXAMPLES OF SOIL-BASED FIELD USE

San Carlos Favela, Rio De Janiero, Brazil

RESEARCH

- EXAMPLES OF SOIL-BASED FIELD USE

Alemao, Rio De Janiero, Brazil

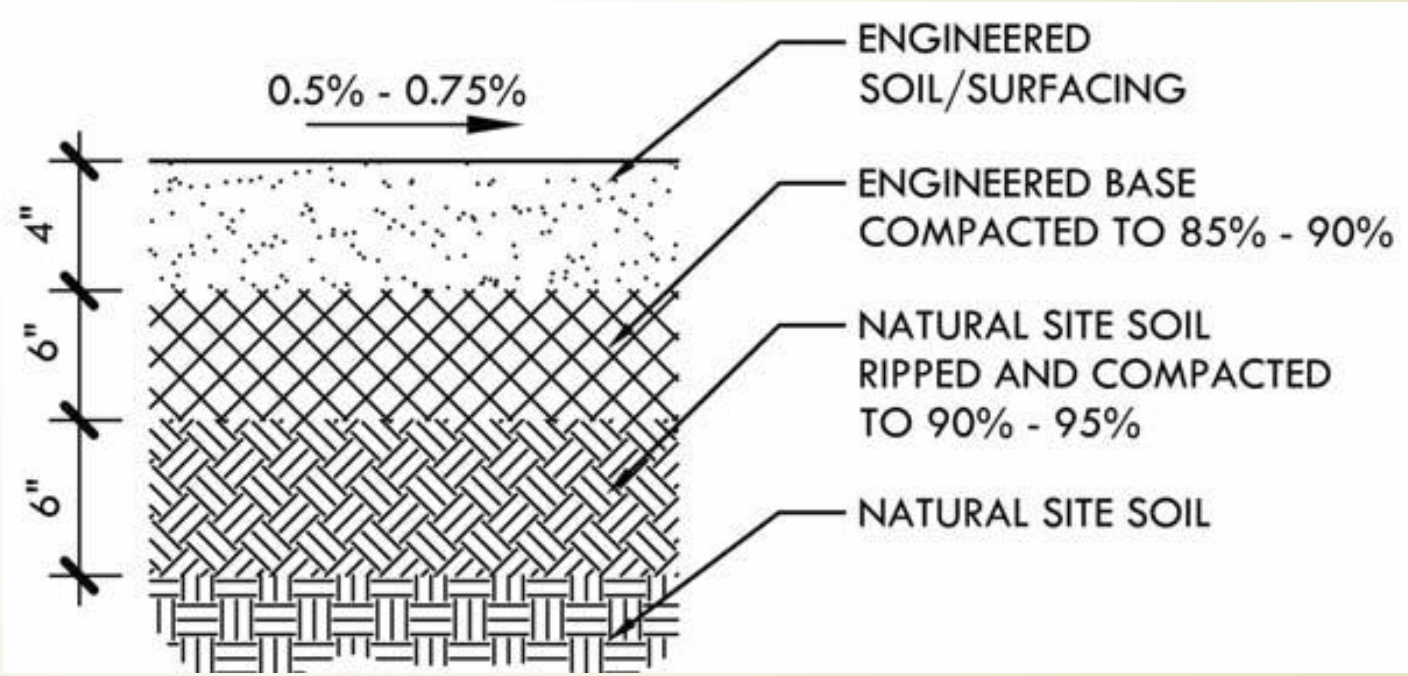
RESEARCH

- EXAMPLES OF SOIL-BASED FIELD USE

Example of a soil field with lighting

ANALYSIS

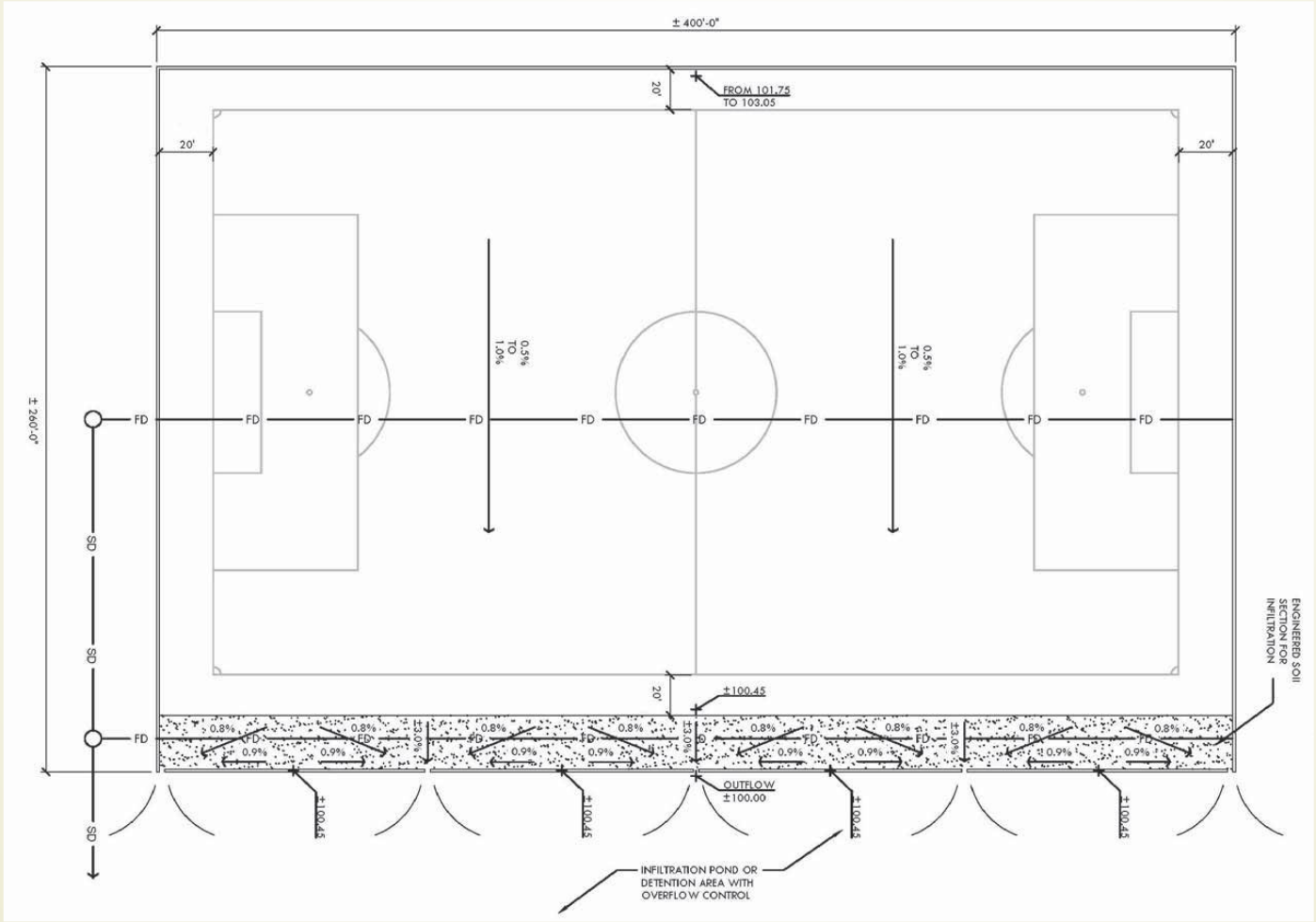
- PROFILE OPTION A:ONSITE SOIL ONLY
  - COST: $780,000
- PROFILE OPTION B: SPECIAL FIELD FINES
  - COST: $850,000
- PROFILE OPTION C: ENGINEERED SOIL
  - COST: $880,000

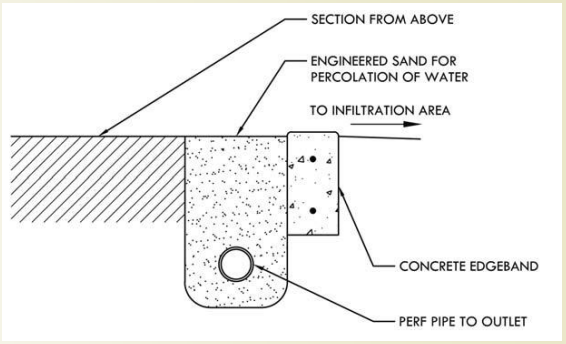


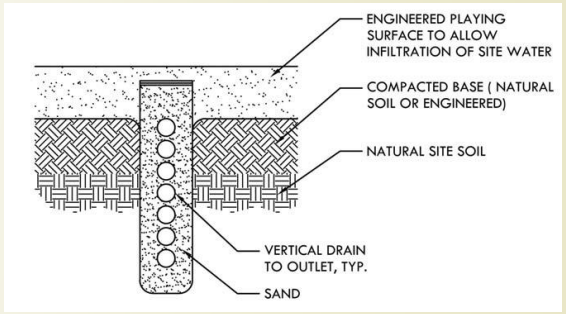
Soil Profile

RESEARCH

- FIELD WITH DRAINAGE







Example of a soil field drainage system

COST COMPARISON

CONSTRUCTION	• Engineered Soil: $780,000 - $880,000 • Natural Grass: $370,000 • Artificial Turf: $1,400,000
ESTIMATED ANNUAL MAINTENANCE	• Engineered Soil: $30,000 • Natural Grass: $68,000 • Artificial Turf: $15,000
20 YEAR LIFE COST COMPARISON	• Engineered Soil: $1,600,00-$2,300,000 • Natural Grass: $2,700,000 • Artificial Turf: $3,400,000
COST PER HOUR OF PLAY	• Engineered Soil: $38.00 • Natural Grass: $91.00 • Artificial Turf:$47.00

COMPARISON

PROS

- COST: $780,000 - $880,000
- DURABILITY
- INCREASED FIELD USE / NO NEED TO "REST" THE FIELD
- SPEED OF PLAY INCREASED, MANY PROFESSIONALS BEGAN ON SOIL FIELDS
- MULTI-PURPOSES FOR THE FIELD
- REDUCED OR NO FEES
- 20%-40% LESS WATER

CONS

- VISUAL QUALITY
  - FILEDS LOOK DIFFERENT FROM OTHER FIELD
- DUST
  - FIELDS WILL HAVE A WATERING SYSTEM
- ABRASIONS

QUESTIONS ?

ALTERNATIVE SPORTS FIELDS

PRC AGENDA: 02-03-16
ITEM: VI. B.

ALTERNATIVE SPORTS FIELD

FEASIBILITY STUDY - FINAL DRAFT

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(408) 535-3500
August 13, 2015

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TABLE OF CONTENTS

SECTION 1
INTRODUCTION

At the request of the City of San José, Verde Design prepared a feasibility study to assess the use of soil based fields as a viable alternative to natural grass or synthetic turf for athletic purposes.

A. OBJECTIVE

The purpose of this study is to identify relevant examples of soil based field applications and assess the benefits and drawbacks of developing a soil based field within San José. To assess the feasibility of developing soil based fields, a number of issues must be considered including, but not limited to: the cost for developing a site, athletic performance, operational durability, maintenance requirements, resource consumption, environmental impacts, public safety, and visual quality. This report provides a preliminary overview to determine whether an application of this method is appropriate or desirable for the City of San José.

B. METHODOLOGY

Research for this report was conducted between February and April 2015. Information was collected from the California Park and Recreation Society Development and Operations Board, parks and recreation departments of several large municipalities with experience in soil fields, sports surfacing professionals, and internet research of relevant non-turf playing fields. ▪

Cabo San Lucas, Mexico

SECTION II
RESEARCH

A. EXAMPLES OF SOIL BASED FIELD USE

1. Use of soil based fields outside the U.S.

The use of soil based fields (native material) is quite common outside the United States, especially in developing counties. The use of maidans, or "large open space", is prevalent throughout India, the Middle East, and parts of Europe. Maidans are used for a variety of activities including formal gatherings, protests, parades, sports matches, and everyday informal use. Examples of constructed soil based fields can also be found in certain regions of Japan where local clubs train beginning level soccer players on dirt to introduce children to faster-paced play.

2. Use of soil based fields in the U.S.

While the use of soil based fields, as a constructed playing surface, is rare in the U.S., there were a few examples that provide insight into the logistics of building and maintaining a soil based field facility. Of the agencies contacted, there were three agencies able to provide relevant examples:

a. Pendergast Regional Park, Bremerton, WA has two full sized soccer fields that were built approximately 20 years ago with the anticipation of year-round play at a lower overall maintenance cost. The consistency of the fields has transformed from a beach-like sand surface to a crusted sand/ decomposed granite surface over the years due to lack of maintenance. Both fields have a sprinkler system and lighting system, but are only occasionally used for practice because of the poor surface conditions.

b. Lake Hills Soccer Club, Bellevue, WA have dirt fields at the Lake Hills Soccer Club are essentially a decomposed granite texture, used by children under the age of 7 for practice only. These fields are slated to be replaced with synthetic turf primarily due to the dirt and mud tracked into the school buildings.

c. Trona High School, Trona, CA is located in Southern California's Mojave Desert. Said to be the only true soil based football field in

Children playing soccer on a dirt field

SECTION II
RESEARCH

North America, Griffith Field was given the name "The Pit" by the visiting teams and has the reputation of creating a decided advantage for the home team. Due to the harsh climate, turf is too difficult to maintain and games are played at night.

Detailed information on these facilities can be found in Appendix A.

B. EXPERT CONSULTATION

Professionals in soils design were contacted for possible methods of developing a soil, or soil composite field system. All systems considered would require routine maintenance including watering to maintain soil plasticity.

1. Adrian Ruvalcaba of Gail Materials, Corona, CA, felt the approach would be similar to that of a baseball infield. He stated that the soil science is not perfect and depends on testing various ratios of sand, silt and clay to empirically develop the best mix. Adrian recommended starting with a mix of 70% /20% silt/10% clay. The ratio of course to fine sand significantly effects soil cohesion.

2. Matt Moore of TMT Enterprise, San Jose, CA also recommended developing a surface similar to that of a baseball infield. Stanford's "Sunken Diamond" will be renovated this fall with a new clay mix developed in concert with the University Athletic Department. The new soil section will be composed of a specially engineered 4" clay surfacing over a compacted base. The clay surfacing will consist of a mix of calcined clay (which absorbs water) and vitrified clay (which allows water to pass through). The field will require daily watering for collegiate play. Recreational play would likely only require watering 3 to 4 times per week, depending on the season and weather conditions. ▪

San Carlos Favela, Rio De Janiero, Brazil

SECTION III
ANALYSIS

A. FIELD LAYOUT OPTIONS

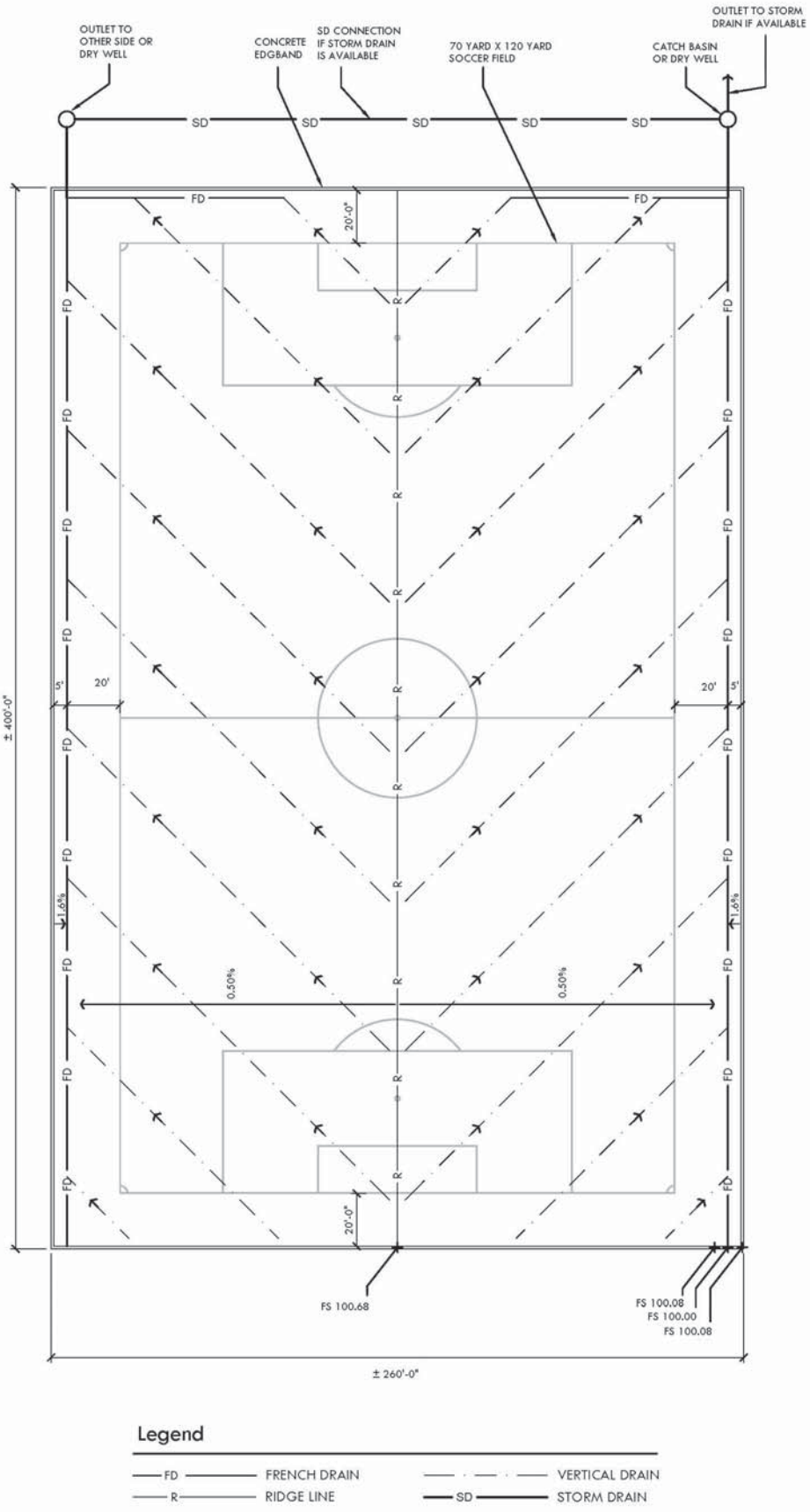
Three field layout alternatives and four soil profile options were developed that range in engineering effort and cost. Estimated costs can be found in Appendix B. The options are as follows:

Field Layout Alternative 1: Drain to Catch Basin
Alternative 1 utilizes the same technique for handling stormwater runoff found with traditional natural grass fields. The watershed is divided in half lengthwise with a crowned field and a center ridge and collected along the sidelines. The assumption with this design is that there is an offsite location that accepts silted runoff for processing. The total estimated cost varies depending on the soil profile option selected as well as any specific site constraints. The catch basin must be emptied after each season as part of a routine maintenance program.

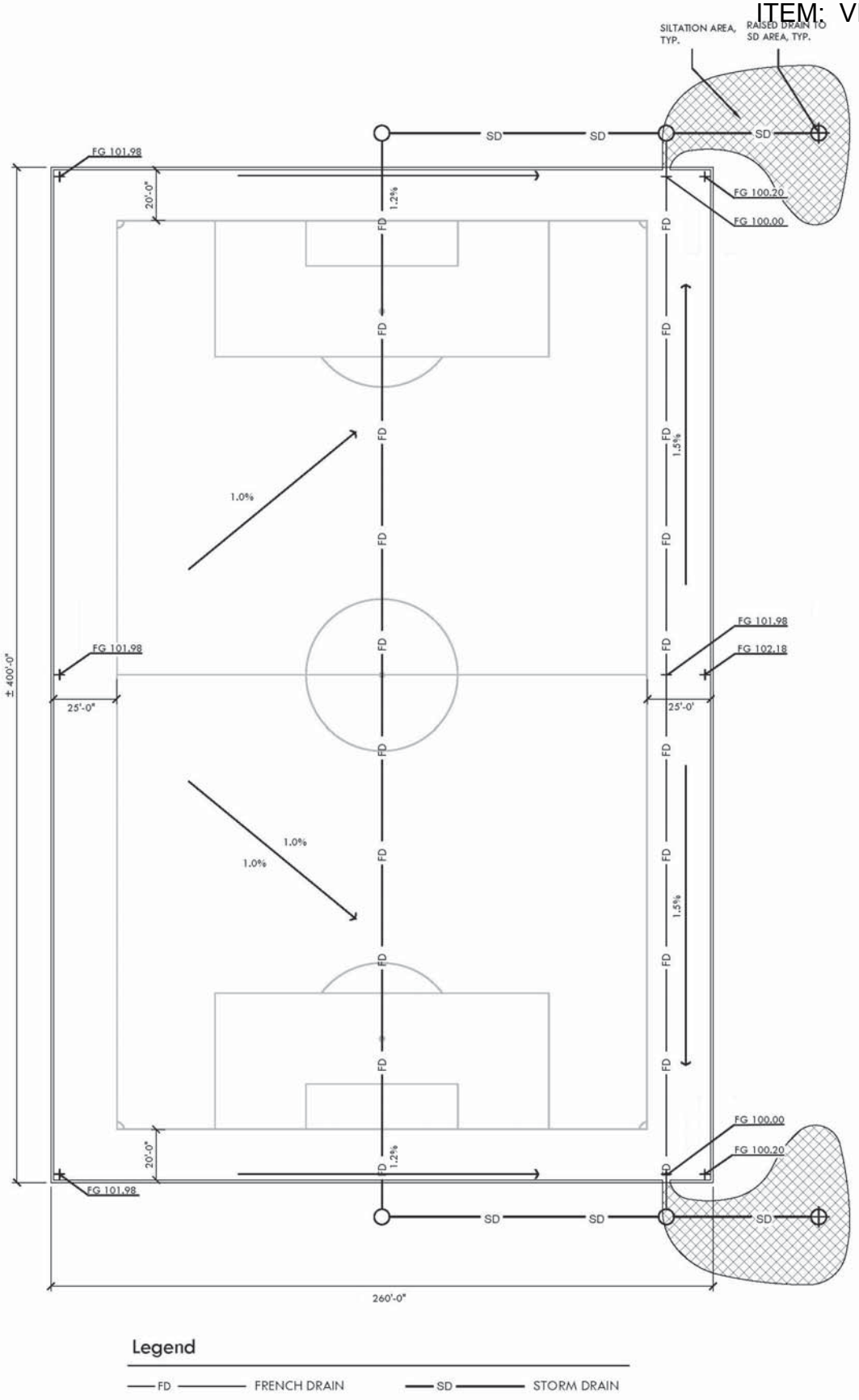
Field Layout Alternative 2: Drain to Siltation Area
Alternative 2 divides the watershed in half width wise and collects runoff into siltation areas at the lower corners of the field. This method provides for onsite stormwater sediment control prior to discharge into a stormwater collection system. Routine dredging is required as the siltation area becomes less pervious.

Field Layout Alternative 3: Drain to Infiltration Pond/Detention Area
Alternative 3 uniformly slopes the field to one side. A subsurface drain down the center of the field divides the watershed in half similar to Alternative 2. An infiltration area or detention pond, located at the lower end of the field, cleans the runoff of sediment before it enters the storm drain. An infiltration pond also holds excess stormwater that may accumulate during a significant storm event and allows it to enter the soil gradually. This is the most ecological design as it reduces the amount of sedimentation entering the storm drain and allows for groundwater recharge. This option also requires seasonal or annual dredging to remove sediment for the infiltration areas. ▪

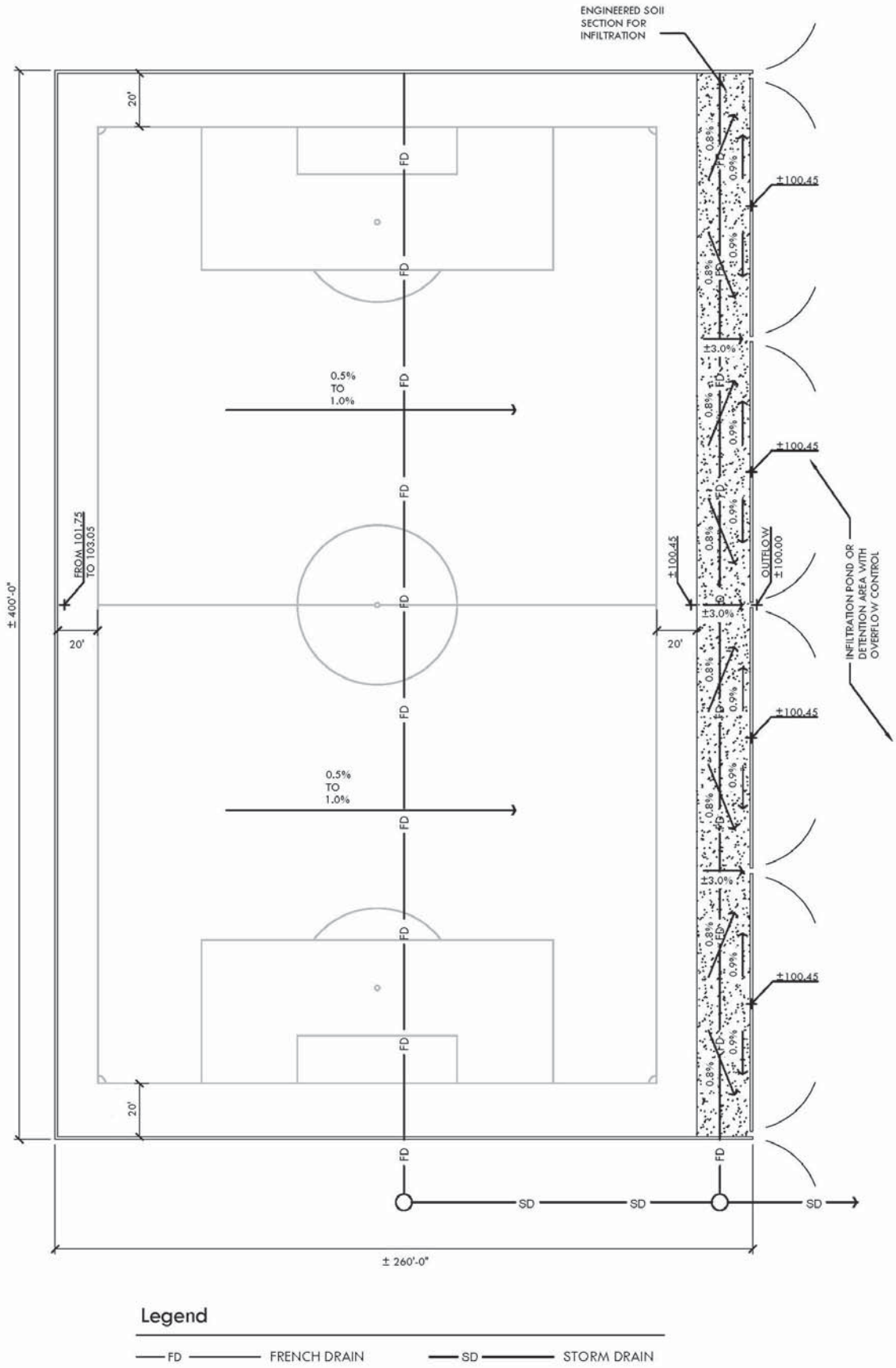
Example of dirt field with lighting



LAYOUT ALTERNATIVE 1: DRAIN TO CATCH BASIN



LAYOUT ALTERNATIVE 2: DRAIN TO SILTATION AREA



LAYOUT ALTERNATIVE 3: DRAIN TO INFILTRATION POND/DETENTION AREA

SECTION III
ANALYSIS (CONT.)

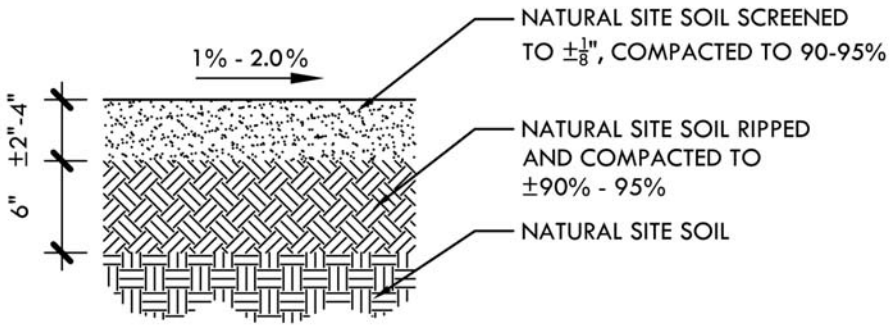
B. SOIL PROFILE OPTIONS

There are a number of soil profile options that range in cost and performance. The best option greatly depends on the properties of the existing site soils, however, below are three possibilities that range in intensity from the use of onsite soil exclusively to special infield fines to engineered soil.

If onsite soil is utilized samples must be analyzed to learn if it is suitable for sport applications. Typically, the soil in San Jose is high in clay therefore moisture is required to prevent cracking and mitigate dust. The use of onsite soil may not be the best option in cases of low infiltration and high compaction. If an engineered soil is utilized, a customized mix of sand, silt, and clay must be developed to ensure predictable performance and consistency.

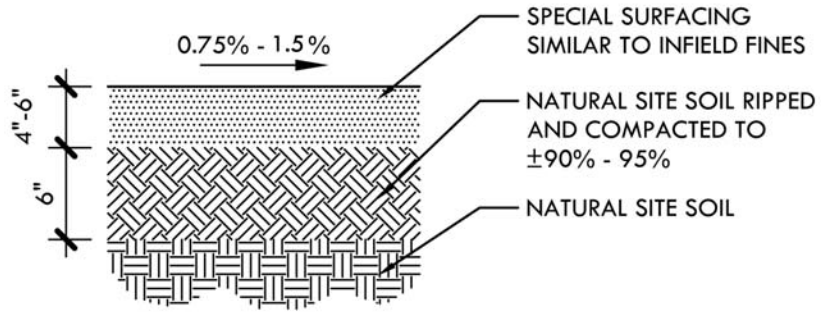
1. Profile Option A: Onsite Soil Only

The use of onsite soil requires the lowest development cost, assuming the soil is suitable. Suitable soil requires low clay content and high sand/silt content. Site preparation includes grading to conform to the proposed field design, engineering of the stormwater drainage system, and installation of the irrigation to ensure proper moisture levels.



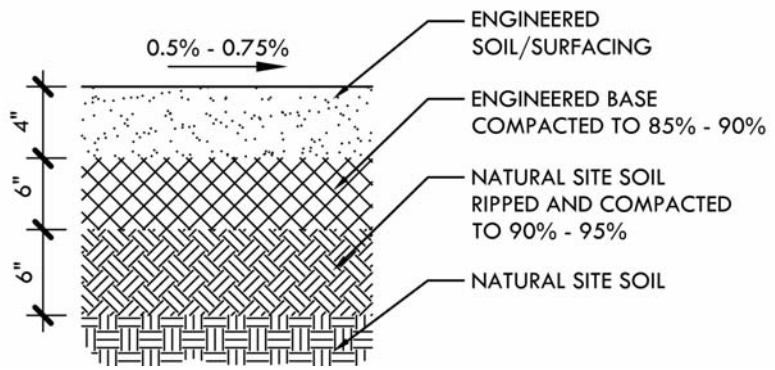
2. Profile Option B: Special Field Fines

The use of special field fines involves the application of special surfacing fines over a compacted base, similar to that of a baseball infield. The surface hardness is dependent on the moisture content, yet is relatively firm. A field tarp may be required to maintain soil moisture levels, reducing the need for irrigation. This option has less permeability within the soil profile area.



3. Profile Option C: Engineered Soil

The use of engineered soil is the most intensive soil profile option that requires engineering a customized soil mix of soil, sand, and clay to maximize water holding capacity, minimize compaction, and ensure an adequate playing surface. Gail Materials proposes a mix of 70% sand/20% clay /10% silt. For the sand portion, coarse to medium sands comprises over 50% with very fine sand under 5% to maintain soil cohesion. However, sample test plots may need to be developed, utilized, and maintained to determine the best soil mix for this region.



Dirt field in Tasiilaq, Greenland

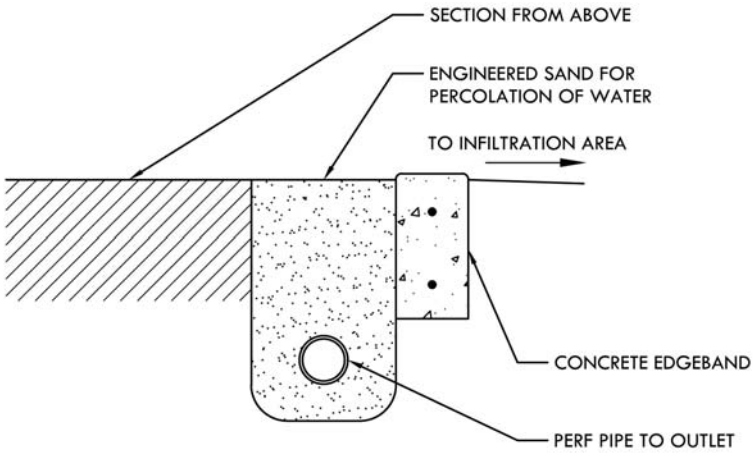
SECTION III
ANALYSIS (CONT.)

C. DRAINAGE SYSTEMS

The following section details describe two typical drainage conditions:

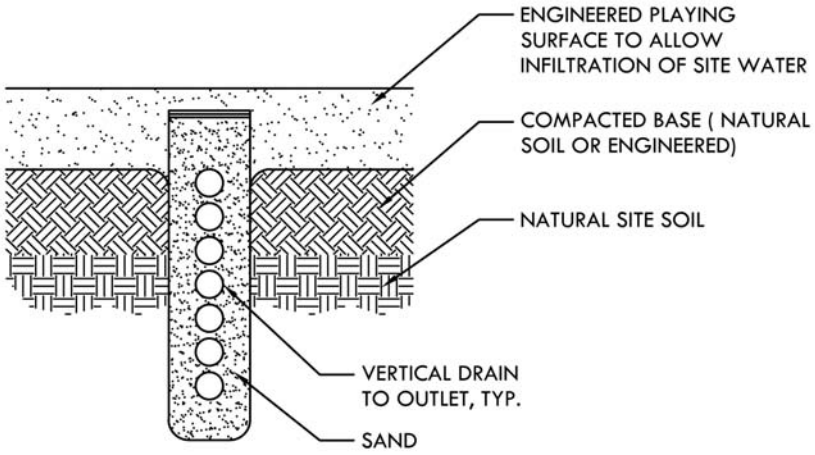
1. Perforated Pipe and Sand Filtration Detail

This method is typically used on the perimeter or low side of the field to collect and filter sediment from the stormwater runoff as seen in Alternative 1,2, and 3 (p4, 5, 6).



2. Vertical Drain and Sand Filtration Detail

This system moves large amounts of runoff to a perimeter collection system from the field interior as seen in Alternative 1 (p4).



D. COST TO DEVELOP

The development of an engineered soil based fields ranges from $800,000 to over $1 million depending on the location and existing site conditions. See Appendix B for the estimated costs for the three design options. The following considerations must be addressed when considering the total cost impact for any project:

1. Irrigation

Soil based fields require an irrigation system to control dust and ensure proper moisture levels. Automatic and manual water systems are available such as interior sprinklers, perimeter sprinklers, a water tractor, or portable sprinkler system (such as the Kifco watering system.) The amount of water needed depends on the soil profile, climate, and frequency of play. Compared to natural grass, a soil based fields uses between 20% to 40% less water depending on climate condition, time of year, and use.

2. Drainage

Stormwater contamination is a primary concern. An intensive stormwater detention and filtration system may be required to capture and treat sediment in compliance with the California Regional Water Quality Control Board, the City, and SWPP guidelines for stormwater management.

In addition, eroded material needs to be routinely replaced. A stockpile of soils is recommended to replace eroded soil and address field planarity issues.

3. Environment

Environmental contamination due to airborne dust particles is a major consideration. Even when not in use, a soil based field may require consistent watering to suppress erosion caused by wind and other environmental factors. Heat gain must also be taken into account as the ambient temperature on a dirt field can be much warmer than their turf counterpart.

Example of dirt field

SECTION III
ANALYSIS (CONT.)

4. Safety

There are two standard measurements to quantify the safety of a field: the G-max test and the Head Injury Criterian (HIC). The G-max test is common when evaluating the firmness of a sports field and measures the force exerted on a surface by dropping a weighted cylinder. These tests are typically used when evaluating synthetic turf and are not required for the evaluation of natural grass or baseball infields. Currently, the American Society for Testing and Materials (ASTM) states that a G-max score of 165 is allowed on synthetic turf fields with discussions of lowering the upper limit to 120 soon. A G-max score of 200 can result in fatal head trauma.

The HIC is a measurement of the likelihood of head injury from the impact of a given surface. Concussions were found to occur in most athletes at a score of 250 with 700 being the maximum acceptable score that could result in severe injury.

For comparison, Edgar Llamas, Regional Technical Director for Brock International, performed a HIC test on a baseball infield at Metz Park in Perris, CA on April 29, 2015. The baseball infield significantly failed the HIC test at less than 3 feet with a score ranging from 758 to 977. Details results can be found in Appendix D.

Neither G-max nor HIC testing had been completed for any of the soil based fields examined in this report, however, due to the abrasive nature of the material a higher level of scrapes on arms and legs were reported on Trona High School's Griffith Field.

5. Maintenance

Providing adequate field maintenance is the key to creating a safe and quality field. The level of maintenance required is similar to that of a baseball infield.

Example of dirt field

During the planning stage, there are a number of critical questions to ask that determine the feasible level of maintenance including:

A. What organization is responsible for maintenance?
B. What is the annual field maintenance budget and funding sources?
C. What equipment and expertise is available?
D. What sports or events will use the field?
E. How many games will be played per day, week, month and year?
F. What are the player's ages who will be using the field?

Specialized equipment must be purchased and stored including: chalk line markers, push brooms, drags (see below), rakes, shovels, string lines, tamps, watering equipment (irrigation, hoses, spray nozzles, or water truck), wheelbarrows, line marking materials, and a stockpile of soil and soil conditioner for fill and field repair.

Drags are specialized equipment that help disturb hardened surfaces and create a level playing surface. Three types of drags are typically used to prepare the field: nail, steel and roller. Each drag or roller is typically attached to the back of a vehicle. Some motorized maintenance vehicles are equipped with dragging attachments.

The use of an approved pre-emergent herbicide is recommended to manage weed propagation.

The following is a suggested method to prepare a dirt field for play based on care for a clay based baseball infield:

A. Short term or daily maintenance
    1. Adequately water the field to mitigate dust and maintain soil moisture
    2. Use drags to ensure planarity of the playing surface.
        a. Nail Drag: to scarify or loosen the field and smooth out ruts and gouges
        a. Steel Drag: to smooth out the field
        b. Roller: to flatten the surface in preparation for the field striping if used
    3. Add soil conditioner to affected areas as needed to maintain adequate consistency
    4. Use a string line to determine field dimensions and apply field markings with a chalk line marker. The use of tufts can be installed permanently to demarcate field boundaries, negating the need to apply lines before every game
B. Monthly maintenance
    1. Re-grade the top coat to near original elevations
    2. Remove weeds from the field and use areas
    3. Make repairs to the field as needed
C. Annual to semi-annual maintenance
    1. Re-grade the top coat to original elevations
    2. Inspect and clean drainage systems as needed
    3. Inspect and repair the irrigation system as needed
    4. Inspect and repair the field surface as needed
    5. Re-apply pre-emergent herbicide to the field and associated use areas.

6. Visual Quality

While the aesthetic value of a soil based field is subjective in nature, the areas surrounding the field (including parking lots, adjacent building facades and interiors) may be subject to increased levels of clutter due to transference of soil by people and environmental factors. This was cited as the primary reason the Bellevue School District is in the process of converting their soil based fields to synthetic turf. Maintaining proper moisture will reduce this issue. A field that is dry may have "dust up" periods during play that can affect visibility and adhere to players. ▪

SECTION IV
RECOMMENDATIONS

BASIS OF RECOMMENDATION

Cost

The relative cost to develop may be less than or equal to lower than its traditional sports field counterparts depending on the selected layout and soil profile. Soil based fields appear to be favorable over a 20 year life when compared to more traditional sports field designs (refer to Appendix C). The cost per hour of available play (as long as the fields are adequately maintained), maintenance requirements, and resource consumption appear to be lower than natural grass or synthetic turf fields.

Safety

Although no formal safety studies have been done on soil based field, minor injury appears to be more common. The data collected from a baseball infield appears to reflect very poor HIC performance, which would be expected. Refer to Appendix D for additional information on surface testing.

Durability

Soil based fields are able to withstand harsh climatic conditions, especially intense direct sun and high temperatures. In order to maintain an adequate, safe playing surface a specific mix of soils is required in addition to time and resources to perfect the final soil composition.

Environment

Environmental considerations are harder to predict as they are highly dependent on site-specific conditions such as wind patterns, exposure, soil profile, and length and type of use. Sediment control remains the biggest environmental concern and may require extensive sediment abatement systems. While water use may appear to be lower than that of natural turf, soil based fields require an adequate amount of water to ensure a playable surface, improve the safety of the players, and mitigate dust.

Dirt field in Agdz, Morocco

RECOMMENDATION

If the City decides to explore this option further, it is recommended that one or more test plots be developed, utilized, and maintained to determine the best suitable surface, resource consumption, required maintenance level, and field integrity over a period of time.

We believe the city should prepare one or more test plots of 25' by 25', or greater, to learn of the benefits and drawbacks of the recreational athletic use of a soil based field. There may be an opportunity to experiment with a mix ratio that includes the addition of crumb rubber to the soil receipt.

We recommend the first test plot should utilize Field Layout Alternative 3 (Drain to Infiltration Pond) and Soil Profile Option A (Onsite Soil Only) as an appropriate first test. Other soil profile options and engineered soil mixes can be developed to provide a side-by-side comparison and ensure and the selection of the best possible playing surface. ▪

APPENDIX A
DETAILED CASE STUDIES

I. Pendergast Regional Park, Bremerton, Washington

Wyn Birkenthal, Director, (360) 473-5305
Parks and Recreation, Sherican Park Community Center
680 Lebo Blvd., Bremerton, WA 98310
Jeff Elevado, Maintenance Manager, (360) 473-5428.

The following came in a conversation with Verde staff:

- The two soccer fields at Pendergast Regional Park are still being used.
- The fields were built in 1995 when people were looking for a lower cost field to be used in any type of weather.
- Playability on the fields today is tough as the fields are mostly sand now. The fields are rough, not particularly level and have soft spots where the surface has been repaired which can result in turned ankles and the like.
- In 1995, grass was not the best option because of rain and expected over use.
- The goal was to build fields that were easy to maintain in addition to providing a quick turnaround for useful play. In the area, grass did not have a quick enough turnaround for the play at the time.
- The fields are built the same as a natural grass or synthetic turf field as they were being built in that area at that time.
- Drainage was installed as part of a concrete curb that is shaped as a low gutter with a grass apron around the perimeter of both fields. The runoff is channeled to a water retention area elsewhere on site.
- The area receives 50" to 60" of rain annually.
- Early on, both fields worked well with maintenance being only dragging, similar to a baseball infield.
- Heavy rain would cause channeling on the fields and over time the drainage system silted and was not working well.
- The field surface had a lot of fines that would migrate leaving a very compacted field surface.
- The lower field would "get hammered" with a heavy rain making it almost unusable today.
- The upper field is much better and is the field generally the city directs for use.
- Currently not a great amount of maintenance is spent on the fields.
- The current staff was not involved with the development of the fields in 1995, but has inherited them and learned from them. If there was an opportunity to renovate the field, they would have provided a surface with cleaner fill with less fines. Staff learned from observing the building some of their newer baseball fields that there is more involved with the type of 'dirt' to be installed.
- Current users find their soccer balls are seriously scuffed up in a very short time as are the knees. Surface is very rough.
- During the summer the fields turn into a dust bowl.
- The fields are a usable system, though not attractive.
- A lot of soccer teams will not play on the fields. The fields are used for practice and Rugby.
- Jeff said he would look for better options other than dirt for a field surface since they are basically a sandpit.
- It is soccer season now and dark at 4:30 pm. Since both fields have sports lighting, they are available as a field of last choice, so youth groups use the fields for practice.
- There are other fields in the area that are available and preferred by soccer.
- Pendergast Regional Park has an advantage of being centrally located, with great parking, with lighted fields that are available.
- The City of Bremerton has no capital funding available to convert the fields to synthetic turf.

- There is a local youth soccer group that has leased the fields from the city and is raising money to develop the fields in synthetic turf. They have had success with raising money and developing other fields in the area.
- The City feels that converting the fields to synthetic turf would be relatively simple since the drainage and lights already exist. The youth soccer league feels that it would take $500,000 for the conversion, a budget which is believed to be optimistic.
- The one significant problem developers have in the area is hardpan which is only 12" below the surface in some park locations.

View of the Lower Field (above) and siltation around perimeter drain inlet (below) at Pendergast Regional Park

Aerial of Pendergast Regional Park, Bremerton, WA

II. Lake Hills Soccer Club, Bellevue

Kyle McCloud, Project Director
PO Box 6744, Bellevue WA 98008
(425) 456-4501

The Lake Hills Soccer Club has soccer programs for boys and girls for ages from (U6) or 6 years old through (U18) 18 years of age. Their programs are grouped into Micro U6–U7, Mod U8-U11 and Recreational U12-U18. During the 8 week season, Micro teams work on beginning levels of skill development through a combination of clinics, practice, and fun games. From the Club Schedule, Micro teams are the only teams that practice at the various dirt fields shown below. The actual games are played at natural grass facilities.

A 'dirt' sports surface was a consideration by the District for outside play of their students because of the perceived low maintenance and increased field availability during the winter season. Because of the 'dirt" surface, Lake Hills Soccer Club was allowed to use the existing fields for their U6-U7 programs. In this region, natural grass has difficulty surviving during the wet season, which is when their soccer season is open. The partnership did not impact the students as play was after school hours and on weekends.

In conversation with the Facilities Department, the District is currently renovating a number of their schools and converting all of their existing dirt fields to synthetic turf. The project director confirmed that the District is in a 7+ year renovation program that will ultimately convert all of the existing dirt fields to synthetic turf. One primary reason was the mud and dirt tracked into the school buildings causing damage to the floors, walls and doors at the various schools.

Highland Middle School, Bellevue

Richard Bennett Elementary School, Bellevue

Cherry Crest Elementary School, Bellevue

Phantom Lake Elementary (Upper Field)
Tillicum Middle School (Lower Field)

III. Trona High School, Trona, CA

Kent Schmidt, Athletic Director (760) 372-2875
Mark Goins, Chief Maintenance Officer (760) 372-2821

The following information is from a conversation with Verde staff:

- A video was produced in 2009 by the LA Times and a 2009 article about the field.
- For the video… Google LA TIMES / TRONA FOOTBALL
- Water is a premium. In the 1980's a special blend of salt tolerant natural grass that was tried. Watering would alternate one week of with domestic water and one week with salty lake water. The maintenance requirements were very high and the grass field soon died.
- The dirt football field started with natural 'desert sand' that was watered and dragged into a football field.
- There is no sprinkler system so all watering is accomplished with a water truck.
- In 1982 there was a power redistribution system built which built the field lights.
- During football season, preparation will start at 6:00am and be complete by 3:00pm.
- Once the field is watered, a steel drag to get the field into shape. The field is then
- rolled with a steel roller to firm the surface and striped with lime chalk.
- To prepare the, the field is watered then drag with a steel drag 2-3 times per week.
- There is no G-max testing of the field.
- When asked, Mark said injuries don't appear to be higher. What is higher are the scrapes on the arms and legs of the athletes.
- The in addition to a dirt football field, the school has similar baseball and softball fields on campus. ▪

Griffith Field aka "The Pit" at Trona High School, Trona, CA

Preparation begins by applying 4,000 gallons of water.

The field is now reading for the rake.

The rake is pulled behind a maintenance vehicle.

Once planarity is achieved with the rake, the field is rolled.

Striping is applied before every game.

Once striping is complete, the field is ready for play.

The field surface is not as hard as one might expect.

Games are typically played at night due to high daytime temperatures.

APPENDIX B
ESTIMATED COSTS

City of San Jose
Dirt Field Feasibilty Study - Field Layout Alternative 1
Preliminary Statement of Probable Construction Costs
May 22, 2015

Verde Design
Job# 1415300-0012
Prepared By: JJ
Reviewed By: GH/DM

Site Preparation & Demolition	Quantity	Unit	Unit Cost	Extension
Clear and Grub	105,324	sf	$0.30	$31,597
Utility Demolition	1	ls	$10,000.00	$10,000
Misc. Demolition	1	ls	$5,000.00	$5,000
Total Site Preparation & Demolition				**$46,597**
Grading, Drainage & Utilities				
Rough Grading	105,324	sf	$0.70	$73,727
Pickup 4" soil, screen for gradation & reinstall (native soil only)	105,324	sf	$1.50	$157,986
Storm Drain System				
24" Catch Basin / Junction Box	4	ea	$1,700.00	$6,800
8" Clean Out	2	ea	$350.00	$700
8" Storm Drain	312	lf	$30.00	$9,360
8" French Drain	1,026	lf	$40.00	$41,040
Vertical Drain	3,268	lf	$15.00	$49,020
Storm Drain Connection - on site	1	ea	$1,000.00	$1,000
Total Grading, Drainage & Utilities				**$339,633**
Hardscape & Surfacing				
6" Concrete Edgeband	1,328	lf	$15.00	$19,920
Total Hardscape & Surfacing				**$19,920**
Irrigation				
Irrigation Controller	1	ea	$15,000.00	$15,000
Main Line	1,088	lf	$9.00	$9,792
Irrigation System	105,324	sf	$1.50	$157,986
Total Irrigation				**$182,778**
Subtotal				$588,928
Survey, Permits, Traffic, SWPPP, etc. - 5%				$29,446
Bonding 2%				$11,779
Mobilization & Project Management 7.5%				$44,170
Design Contingency 10%				$58,893
Construction Contingency 8%				$47,114
Total - Field Layout Alternative 1 - Profile Option A - Onsite Soil Only				**$780,330**
Add for Profile Option B - 4" Special Infield Fines	$75	Base onsite soil (less screening cost)		$430,942
Off Haul 4" native soil	105,324	sf	$0.45	$47,396
Import 4" infield fines @ $75/ton	105,324	sf	$1.56	$164,569
Contingencies 32.5%				$208,944.63
Total - Field Layout Alternative 1 - Profile Option B - Special Infield Fines				**$851,851**
Add for Profile Option C - 4" Engineered Soil	$85	Base onsite soil (less screening cost)		$430,942
Off Haul 4" native soil	105,324	sf	$0.45	$47,396
Import 4" engineered soil @ $85/ton	105,324	sf	$1.77	$186,511
Contingencies 32.5%				$216,076
Total - Field Layout Alternative 1 - Profile Option C - Engineered Soil				**$880,925**

Notes:
1) Design contingency is for further development of design and compensates for unknown elements. We will eliminate as we move to Bid Documents
2) Bidding contingency is provided due to an unstable bidding environment and accelerated material price increases. This may be removed as proceed into the project bidding phase.
3) Construction Contingency is provided to cover for site conditions and additional work not anticipated for upgrades.
4) In Providing opinions of probable construction cost, the Client understands that the Landscape Architect has no control over costs or the price of labor equipment or materials, or over the Contractor's method of pricing, and that the options of probable construction costs provided herein are to be made on the basis of the Landscape Architect's qualifications and experience. The Landscape Architect makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

City of San Jose
Dirt Field Feasibilty Study - Field Layout Alternative 2
Preliminary Statement of Probable Construction Costs
May 22, 2015

Verde Design
Job# 1415300-0012
Prepared By: JJ
Reviewed By: GH/DM

Site Preparation & Demolition	Quantity	Unit	Unit Cost	Extension
Clear and Grub	105,324	sf	$0.30	$31,597
Utility Demolition	1	ls	$10,000.00	$10,000
Misc. Demolition	1	ls	$5,000.00	$5,000
Total Site Preparation & Demolition				**$46,597**
Grading, Drainage & Utilities				
Rough Grading	105,324	sf	$0.70	$73,727
Pickup 4" soil, screen for gradation & reinstall (native soil only)	105,324	sf	$1.50	$157,986
Bio Swale	5,880	sf	$7.00	$41,160
Storm Drain System				
24" Catch Basin / Junction Box	4	ea	$1,700.00	$6,800
8" Clean Out	4	ea	$350.00	$1,400
8" Storm Drain	322	lf	$30.00	$9,660
8" French Drain	846	lf	$40.00	$33,840
Storm Drain Connection - on site	1	ea	$1,000.00	$1,000
Total Grading, Drainage & Utilities				**$325,573**
Hardscape & Surfacing				
6" Concrete Edgeband	1,328	lf	$15.00	$19,920
Total Hardscape & Surfacing				**$19,920**
Irrigation				
Irrigation Controller	1	ea	$15,000.00	$15,000
Main Line	1,088	lf	$9.00	$9,792
Irrigation System	105,324	sf	$1.50	$157,986
Total Irrigation				**$182,778**
Subtotal				$574,868
Survey, Permits, Traffic, SWPPP, etc. - 5%				$28,743
Bonding 2%				$11,497
Mobilization & Project Management 7.5%				$43,115
Design Contingency 10%				$57,487
Construction Contingency 8%				$45,989
Total - Field Layout Alternative 2 - Profile Option A - Natural Site Soil				**$761,700**
Add for Profile Option B - 4" Special Infield Fines	$75	Base onsite soil (less screening cost)		$416,882
Off Haul 4" native soil	105,324	sf	$0.45	$47,396
Import 4" infield fines @ $75/ton	105,324	sf	$1.56	$164,569
Contingencies 32.5%				$204,375.13
Total - Field Layout Alternative 2 - Profile Option B - Special Infield Fines				**$833,222**
Add for Profile Option C - 4" Engineered Soil	$85	Base onsite soil (less screening cost)		$416,882
Off Haul 4" native soil	105,324	sf	$0.45	$47,396
Import 4" engineered soil @ $85/ton	105,324	sf	$1.77	$186,511
Contingencies 32.5%				$211,506.44
Total - Field Layout Alternative 2 - Profile Option C - Engineered Soil				**$862,295**

Notes:
1) Design contingency is for further development of design and compensates for unknown elements. We will eliminate as we move to Bid Documents
2) Bidding contingency is provided due to an unstable bidding environment and accelerated material price increases. This may be removed as proceed into the project bidding phase.
3) Construction Contingency is provided to cover for site conditions and additional work not anticipated for upgrades.
4) In Providing opinions of probable construction cost, the Client understands that the Landscape Architect has no control over costs or the price of labor equipment or materials, or over the Contractor's method of pricing, and that the options of probable construction costs provided herein are to be made on the basis of the Landscape Architect's qualifications and experience. The Landscape Architect makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

City of San Jose
Dirt Field Feasibilty Study - Field Layout Alternative 3
Preliminary Statement of Probable Construction Costs
May 22, 2015

Verde Design
Job# 1415300-0012
Prepared By: JJ
Reviewed By: GH/DM

Site Preparation & Demolition	Quantity	Unit	Unit Cost	Extension
Clear and Grub	105,324	sf	$0.30	$31,597
Utility Demolition	1	ls	$10,000.00	$10,000
Misc. Demolition	1	ls	$5,000.00	$5,000
Total Site Preparation & Demolition				**$46,597**
Grading, Drainage & Utilities				
Rough Grading	105,324	sf	$0.70	$73,727
Pickup 4" soil, screen for gradation & reinstall (native soil only)	105,324	sf	$1.50	$157,986
Storm Drain System				
Engineered Sand	8,000	sf	$1.00	$8,000
24" Catch Basin / Junction Box	2	ea	$1,700.00	$3,400
8" Clean Out	2	ea	$350.00	$700
8" Storm Drain	161	lf	$30.00	$4,830
8" French Drain	844	lf	$40.00	$33,760
Storm Drain Connection - on site	1	ea	$1,000.00	$1,000
Total Grading, Drainage & Utilities				**$283,403**
Hardscape & Surfacing				
6" Concrete Edgeband	1,328	lf	$15.00	$19,920
Total Hardscape & Surfacing				**$19,920**
Irrigation				
Irrigation Controller	1	ea	$15,000.00	$15,000
Main Line	1,088	lf	$9.00	$9,792
Irrigation System	105,324	sf	$1.50	$157,986
Total Irrigation				**$182,778**
Subtotal				$532,698
Survey, Permits, Traffic, SWPPP, etc. - 5%				$26,635
Bonding 2%				$10,654
Mobilization & Project Management 7.5%				$39,952
Design Contingency 10%				$53,270
Construction Contingency 8%				$42,616
Total - Field Layout Alternative 3 - Profile Option A - Natural Site Soil				**$705,825**
Add for Profile Option B - 4" Special Infield Fines	$75	Base onsite soil (less screening cost)		$374,712
Off Haul 4" native soil	105,324	sf	$0.45	$47,396
Import 4" infield fines @ $75/ton or 48 sf	105,324	sf	$1.56	$164,569
Contingencies 32.5%				$190,670
Total - Field Layout Alternative 3 - Profile Option B - Special Infield Fines				**$777,346**
Add for Profile Option C - 4" Engineered Soil	$85	Base onsite soil (less screening cost)		$374,712
Off Haul 4" native soil	105,324	sf	$0.45	$47,396
Import 4" engineered soil @ $85/ton	105,324	sf	$1.77	$186,511
Contingencies 32.5%				$197,801.19
Total - Field Layout Alternative 3 - Profile Option C - Engineered Soil				**$806,420**

Notes:
1) Design contingency is for further development of design and compensates for unknown elements. We will eliminate as we move to Bid Documents
2) Bidding contingency is provided due to an unstable bidding environment and accelerated material price increases. This may be removed as proceed into the project bidding phase.
3) Construction Contingency is provided to cover for site conditions and additional work not anticipated for upgrades.
4) In Providing opinions of probable construction cost, the Client understands that the Landscape Architect has no control over costs or the price of labor equipment or materials, or over the Contractor's method of pricing, and that the options of probable construction costs provided herein are to be made on the basis of the Landscape Architect's qualifications and experience. The Landscape Architect makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

APPENDIX C
20-YEAR LIFE COST COMPARISON

Life Cost Comparison - Soil Based vs Traditional Fields

Construction	Units	Layout 1 Onsite Soil	Layout 1 Infield Fines	Layout 1 Eng Soil	Natural Grass	Synthetic
Area to be Constructed	Sq Ft	105,324	105,324	105,324	105,324	105,324
Hard cost for Construction	$/Sq Ft	$7.41	$8.09	$8.36	$3.50	$13.00
Estimated Cost Hard Cost of Construction		$780,330	$851,851	$880,925	$368,634	$1,369,212

Annual Maintenance	Freq.	Units	Unit Cost	Onsite Soil	Inf. Fines	Eng Soil	Nat Grass	Synthetic
Mowing (freq,ac/hr,wage,equipt/hr)	40	0.75	$100.00	$0	$0	$0	$12,896	$0
Irrigation Repair	2	$/SF	$0.017	$3,623	$3,623	$3,623	$3,623	$0
Turf Repair (Natural Grass)	4	$/SF	$0.022	$0	$0	$0	$9,269	
Turf Repair (Synthetic Turf)	4	$/SF	$0.002					$843
Overseed - applications	2	$/SF	$0.017	$0	$0	$0	$3,623	$0
Aeration	2	$/SF	$0.050	$0	$0	$0	$10,532	$0
Top Dressing	2	$/SF	$0.015	$3,160	$3,160	$3,160	$6,319	$0
Fertilize & Materials	2	$/SF	$0.017	$0	$0	$0	$3,623	$0
Watering Use	Units/ac	1,200	$4.40				$12,767	$0.00
Units/ac (1 unit = 100 Cu Ft = 748.05 gallons)		300		$3,192	$3,192	$3,192		
(City of San Jose top tier rate)								
Grooming(freq,ac/hr,wage,equipt/hr)	4	16.00	$100.00					$6,400
Hrs to rake, drag & groom x hrs avail to play*		1.00	$50.00	$14,850	$14,850	$14,850	$0	
Depris/Trash Pick Up		$.05/$.075		$5,266	$5,266	$5,266	$5,266	$7,899
Estimated Annual Maintenance Cost				$30,091	$30,091	$30,091	$67,918	$15,142

Life Cost Comparison			Unit Cost	Onsite Soil	Inf. Fines	Eng Soil	Nat Grass	Synthetic
Maintenance	**Estimated Annual Maintenance Cost**			$30,091	$30,091	$30,091	$67,918	$15,142
	Annual Increase		2.00%					
Maintenance for year 1 through year 5				$156,593	$156,593	$156,593	$353,448	$78,799
Maintenance for year 6 through year 10				$172,892	$172,892	$172,892	$390,235	$87,000
Maintenance for year 11 through year 15				$190,886	$190,886	$190,886	$430,851	$96,056
Maintenance for year 16 through year 20				$207,416	$207,416	$210,754	$475,695	$106,053
	20 years cost of maintenance			$727,787	$727,787	$731,125	$1,650,230	$367,908
Field Renovation (current yr cost/SF)		Increase	2.00%	$1.25	$1.25	$1.25	$1.25	$6.00
	Year 5	Cost	$1.35	$142,508	$142,508	$142,508	$142,508	
Replace Synthetic	Year 10	Cost	$1.49	$157,340	$157,340	$157,340	$157,340	$7.17
	Year 15	Cost	$1.65	$173,716	$170,310	$173,716	$173,716	
Replace Synthetic	Year 20	Cost	$1.82	$191,796	$188,036	$191,796	$191,796	$8.57
	Renovation and Replacement Cost			$665,360	$658,193	$665,360	$665,360	$1,657,803
	Total 20 Year Life Cost			**$2,173,477**	**$2,237,831**	**$2,277,410**	**$2,684,224**	**$3,394,923**

Cost per hour of available play	Units	Onsite Soil	Inf. Fines	Eng Soil	Nat Grass	Synthetic
Days of annual use		365	365	365	365	365
Maintenance shut down		5	5	5	90	5
Rain days		21	21	21	21	
Wet days after rain		42	42	42	8	
Total days available for use*		**297**	**297**	**297**	**246**	**360**
Maximum daily use for Soccer(Assumes no field lighting)		10.0	10.0	10.0	6.0	10.0
Annual available use hours for sustained growth		2,970	2,970	2,970	1,476	3,600
Cost per hour of play		**$37**	**$38**	**$38**	**$91**	**$47**

Metz Park- Baseball Field
Perris Ca

Ambient temperature: 84°
Surface temperature: 114°

HIC Test Results

Height in cm	Drop 1	Drop 2	Drop 3
55 cm	758	901	977
85 cm	1608	0	0
100 cm	1669	1763	1701

F355 E Missile

Tripod Set in area of play with
Hemisphere set 100 cm from floor

Quarter layed on dirt
base to compare size

Example HIC test that determined unacceptable safety results.

APPENDIX D
SURFACE HARDNESS TESTING

The G-max testing was developed by NASA in association with the automotive industry to determine the magnitude of sustained force the human body (in particular, the head) could withstand before serious effects would occur. The G force, or acceleration of the mass that is applying the force, is correlated with the sustained duration of the force. As an example, a fighter pilot may be subject to G forces of as much as 8 times the normal gravitational force (8 G's) for up to several minutes at which time unconsciousness (a blackout) could occur.

Relative to athletic fields, a player will encounter G forces of 100 to 200 G's or not more than 1000 for HIC over a period of less than 14 milliseconds. It has been determined that a G force of 200 or 1000 HIC over a period of at least 14 milliseconds is considered concussion level. This is for a single encounter. It has been shown by studies conducted by the AMA, that repetitive blows or encounters of up to four to five during an event reduces the needs to 160 G's.

The first and most common test is known as a G-max test where the surface hardness is measured using a Clegg Impact Soil Tester (CIST) equipped with a 2.25 kg (5 lb) missile and a drop height of 455 mm (American Society for Testing and Materials, 2000b) or the F355 method equipped with a 9.1 kg (20 lb) missile and a drop height of 610 mm (American Society for Testing and Materials, 2000a) (Figure below). The missile used for these tests is a flat surface. Impact attenuation, as measured by an accelerometer mounted on the missiles, was used to indicate surface hardness and is reported as G-max, which is the ratio of maximum negative acceleration on impact in units of gravities to the acceleration due to gravity.

The CIST is the standard method to measure the surface hardness of natural turf grass playing surfaces (American Society for Testing and Materials, 2000b).

The second testing method is the Head Injury Criterion (HIC) test which is a measure of the likelihood of head injury arising from an impact. The shape of the HIC missile more accurately replicate the shape of the human head. At a HIC of 1000, one in six people will suffer a life-threatening injury to their brain (more accurately, an 18% probability of a severe head injury, a 55% probability of a serious injury and a 90% probability of a moderate head injury to the average adult). Sport physiologists and biomechanics experts use the HIC in the research of safety equipment and development of guidelines for competitive sport and recreation. In one study, concussions were found to occur at HIC=250 in most athletes. As noted above, a test of more than 1000 for HIC over a period of less than 14 milliseconds is considered concussion level. ▪

Clegg Impact Soil Tester (CIST)

APPENDIX E
CONTACT LOG

2.3.15 Emails were sent to various agencies with the following request:

"We are developing a feasibility study for the City of San Jose that will be looking at dirt or similar material and the playing surface for soccer and other field sports. I am looking for examples of facilities built or renovated to have a dirt playing surface. I am not really looking for grass fields where the water has been disconnected leaving the resulting surface. If you do have any dirt fields, I am interested in learning the pros and cons for using dirt as well as costs to build and maintain so that I can develop some form of life cost as an example. I also would need the location and a contact person that I can call and have a brief conversation about dirt sports fields…"

2.3.15 Bakersfield, dstricke@bakersfieldcity.us

2.4.15 reply from Dave Stricker "Sorry we do not have any dirt soccer fields. Thanks"

2.3.15 San Diego Co., askparks.lue@sdcounty.ca.gov

2.6.15 from Patrick McDonough Patrick.Mcdonough@sdcounty.ca.gov (858) 966-1341 Patrick is on the CPRS Development & Operations Board. The County doesn't have any all dirt fields. But one person did mention that his grandson played soccer on an all dirt field in Palm Desert. Here are the responses I got:

- You may get a different answer from another person but I can say that I do not know of a situation where a grass field was left to go to dirt and has been used as a playfield. I can share that the situation has not occurred in Poway, El Cajon and Coronado. It's probably more likely to occur with a school field.
- Patrick could not think of any fields where we have specifically designed them to be all dirt surfacing.

2.3.15 City of Sacramento sacrecreation@cityofsacramento.org

2.4.15 Rich from City of Sacramento called (916) 551-1317 requesting a clarification if we were looking for poorly maintained fields. I said no, we are interested in fields built intentionally as dirt. Rich was going to do more research and get back with me.

2.4.15 Patrick Maguire, RLA and President of Geller Sports, pmaguire@gellersport.com was contacted because of his extensive knowledge in sports field design. His primary focus is on the design of premium athletic fields and recreational facilities. Patrick said there are some pitches in the UK (and I think Italy) that are essentially oiled sand. The technology comes from the golf industry. Patrick did not know a lot about dirt as a sports surface and said he couldn't imagine that they would either be good to play on or safe. He said he could see them as being "pretty good at tearing your skin off". He felt that they would also likely be very hot in in San Jose's climate / solar conditions. He imagined the ball really getting away from the players unless the fields stay level (which requires maintenance) they would also detract from the game. Patrick felt that without really studying that "it sounds like a terrible idea".

2.3.15 City of Los Angeles Soccer.Munisports@lacity.org - No response

2.10.15 Emails were sent to the following contacts… (No Response except as noted below)

- Zeo-Tech Magic Minerals, zeomagic@yahoo.com
- Imperial Beach, Maro Beltran, Region 712 Commissioner ayso712southbay@gmail.com
- South LA, Rudolph Charles, Region 1031 Commissioner rc@ayso1031.org
- West LA, Steve Mick, Region 70 Commissioner ayso70.coaching@gmail.com
- Beverly Hills, Mike Karon, Region 76 Commissioner commissioner@ayso76.org
- Westminister, Inglewood, Pablo, Urquiza, Reg. 7 Commissioner region7rc@gmail.com
- Los Feliz, Chris Bandouveris, Region 1567 Commissioner chris@centerpnt.com 2.10.15 Hi Gary, Sorry, but I don't know of anything that would be helpful to you. Chris (818) 519-0515
- Brentwood, Topanga, Janet Anderson, Reg. 69 Commissioner sevenandersons@gmail.com
- Glendale – La Crescenta, Aldo Mascheroni Reg. 88 Commissioner rc88@ayso88.org

- Riverside, Cathy Crowder, Region 47 Commissioner commissioner@ayso47.org
- Covina, maybKathie Gonzalez Reg. 602 Commissioner Region602commish@gmail.com
- Hemet, San Jacinto, Aguiloar, Region 137 Commissioner rc@ayso137.net
- Pasadena, La Canada, Al Prado, Region 13 Commissioner rc@ayso13.org
- La Mesa, Stephen Cashman, Region 89 Commissioner stephen.cashman@cox.net
- La Quinta, Manny Becerra, Region 443 Commissioner mannyb2105@gmail.com

2.10.15 The Greater Seattle Soccer League, 9750 Greenwood Ave. North, Seattle, WA 98103

Phone: (206) 782-6831, Fax: (206) 782-6947, Email: soccer@seanet.com (No Response)

2.11.15 Bremerton, WA Parks and Recreation was contacted. Conversation with Jeff Elevado (360) 473-5428 revealed he was familiar with the two "dirt" soccer fields at Pendergast Regional Park in Bremerton. They still exist and Jeff provided good information relative to the current status of the fields. See Appendix B – Case Studies for more information about this facility.

2.11.15 Larry Musser, PRZ Consulting, 3335 Doubletree Ct., Colorado Springs, CO 80921, (719) 265-6003 larry@prz.com

Larry has a lot of clients who are playing on dirt fields that were not intended to be dirt.

- There was one client who placed beach sand on the field thinking the moisture would keep it stable.
- That didn't work so they installed an irrigation system to keep the sand wet.
- The problem was the sand kept moving away from the heads, exposing them and creating a trip condition.
- They never resolved that issue.

2.12.15 Kent Schmidt, AD for Trona USD was contacted regarding Griffith Field (760) 372-2875. Kent suggested talking Mark Goins, Chief Maintenance Officer for the District (760) 372-2821 regarding the "Pit" who would be able to provide specific information about the field.

2.19.15 Conversation with Mark Goins

- Mark said there is a LA Times video available and a 2009 article about the field.
- For the video: Google "LA TIMES / TRONA FOOTBALL"
- In Trona, water is a premium.
- In the 1980's a special blend of natural grass that was salt tolerant was planted.
  - The water source was alternated; one week watering with domestic water and one week with salt water from the lake.
  - The maintenance requirements were very high.
  - The grass field soon died.
- The dirt football field started with a pile of natural 'desert sand' that was heavily watered and dragged.
- The maintenance staff use to groom the dirt field daily.
- There is no sprinkler system so all watering is accomplished with a water truck.
- In 1982 there was a power redistribution system built which built the field lights.
- The Friday night football game during season, starts at 6:00am and is complete about 3:00pm.
  - They water the field and use a steel drag to get the field fluffed up and into shape.
  - Once dragged, they use a steel roller to firm the field then stripe it with lime chalk.
- To get the field ready for practice, they water then drag with a steel drag 2-3 times per week.
- There is no G-max testing of the field.
- When asked, Mark said injuries don't appear to be higher. What is higher are the scrapes on the arms and legs of the athletes.
- In addition to the football field, the baseball and softball fields on campus all share the same dirt sports surface.

3.3.15 California Regional Water Quality Control Board

San Francisco Bay Region (2)
www.waterboards.ca.gov/sanfranciscobay
1515 Clay Street, Suite 1400, Oakland, CA 94612
E-mail: info2@waterboards.ca.gov, Tel: (510)622-2300, Fax: (510)622-2460

Referred to Dale Bowyer (510) 622-2323 who stated that said the RWQCB essentially has no problem with a soil based field as long as no sediment water is allowed to leave the site.

4.10.15 Gail Materials contacted (951) 667-6106; 10060 Dawson Canyon Rd., Corona, CA

A conversation with Adrian Ruvalcaba (adrian@ gailmaterials.net) provided a rough information data sheet with some expected results. Soil science is not perfect but we depend a lot on numbers like these from many replicated samples of the products we use to come up with estimates. Adrian said this would be the first time that he knew of a soccer field intentionally made with a dirt surface, although in theory this application would be identical to a Baseball Field. The attachment has some estimates, the numbers to pay attention to are the ones I have traced with a thick black marker. I am making a guess that a 70% sand to 30% silt + clay is the perfect mixture. We would want to have the coarse to medium sands greater than 50% for the sand portion, along with the most important component having the very fine sands below 5% (this has a huge effect on staying in place and not chipping out). We would also want the silt to clay ratio to be a .50 or in other words 1 part silt to 2 parts clay.

city of San Jose soccer field

	pyrite 2mm	pyrite clay	old dutch	P red clay	nichols 2mm	estimated 3.35 silt	check chandler 2mm	estimated chandler 1mm	mound clay	estimated boron	blend
percentage	40%	0%	0%	0%	0%	0%	40%	0%	0%	20%	100%
sand	81.8	71	3.3	25.9	69.4	55	96.7	99.2	30.1	3.6	72.1
silt	11.6	15.2	31.7	36.8	17.5	29	1.3	0.5	28.9	19.7	9.1
clay	6.6	13.8	65	37.3	13.1	16	1	0.3	41	76.7	18.4
check	100	100	100	100	100	100	99	100	100	100	99.6
1/4"	0	0.8	0	0	0	0	0	0	0	0	0.0
4mm no. 5	0	2.2	0	0	0	0	0	0	0	0	0.0
2mm no. 10	0.2	6	0	0	0	5.6	1	0	0.4	0	0.5
1mm no. 18	14.8	13.1	0.7	4.3	15.5	7.8	26.8	3.7	4.5	0.2	16.7
.5mm no. 35	20	15.5	0.7	5.1	19.1	8.2	32	39	6.1	0.5	20.9
.25mm no. 60	20.1	16.5	0.5	5.1	15.6	13	26.7	41	6.2	0.9	18.9
.10mm no. 140	18.3	17.5	0.6	6.3	12.7	13	10.4	11	7.7	0.9	11.7
.05mm no. 270	8.6	8.4	0.8	5.1	6.5	13	0.8	4.5	5.6	1.1	4.0
SCR	1.76	1.10	0.49	0.99	1.34	1.81	1.30	1.67	0.70	0.26	0.50

This is what I propose, the mix is going to be $75.00/ton not including shipping. It would be expensive but this is not a typical mix that any supplier would understand how to make. We would definitely be up for the challenge. I am guessing that it will be about 1.5 tons per cubic yard.

4.14.15 Matt Moore, TMT Enterprises, 1996 Oakland Road, San Jose, CA (408) 432-9040 was contacted and believes a high clay similar to the San Francisco Giants infield might work. He stressed that a high silt/low clay mix would not be desirable. A professional level baseball infield requires periodic moisture for surface conditioning. Matt mentioned that Stanford's "Sunken Diamond" will be renovated this fall with a new clay mix they are developing in concert with the University Athletic Department. The new soil section be composed of 4" of clay over compacted base and topped with a combined mix of calcined clay (which absorbs water) and vitrified clay (which allows water to pass through). The field will require daily watering for collegiate play. Recreational play would likely only require watering 3 to 4 times per week depending on the season and weather conditions. ▪